

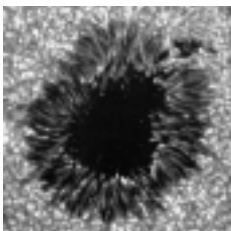
GRADES 3-5

Vocabulary:

axis	element
chromosphere	observation
convection layer	photosphere
core	radiation layer
cycle	satellite
diameter	sphere
dwarf	ultraviolet rays

Activities:

1. Pre/Post Assessment
Student worksheet to assess the student's prior knowledge of the Sun and sunspots.
2. Background information on the Sun and sunspots
Read and discuss the NASA booklet *Our Very Own Star: The Sun* listed in the Internet guide and the book *The Sun* by Herbert Zim listed in the resource guide. Use this information for a class discussion and review about facts about the Sun—its type, shape, distance, size, etc. See Internet sites #1, 10, 11, 12, 14, 15, and 16, page 22.
3. Galileo Sees the Light
Information and question sheet on Galileo, his telescope, and experiments observing the Sun, sunspots, and the planets. See Internet sites #3, 8, and 11.
4. Sunspot Poems
After reading the books and reviewing the Web sites in activity #2, students will write a poem about sunspots. See Internet site #11—Solar poetry.
5. Layers of the Sun Worksheet
Student worksheet that has the student labeling the 4 layers of the Sun and the 2 layers of the Sun's atmosphere. See Internet sites #6, 11, 12, and 14.
6. Our Very Own Star: The Sun puzzle
Student worksheet reviewing basic facts about the Sun and sunspots. (Activities #7-10 are found in the grades K-2 section.)
7. Making a Homemade Sunspot Viewer
Teacher worksheet that gives directions on how to assemble and use the sunspot viewer. The class needs to complete this activity with teacher direction. Teacher should then save the tracing sheets in order to complete the sunspot viewer review. See Internet site #2.
8. Sunspot Viewer Review
Student worksheet to discuss tracings of the Sun and the sunspots.
9. Sunspot Flip Book
Students will assemble the Flip book.
10. Sunspot Flip Book Journal
Student worksheet analyzing the results of the sunspot flip book.
11. Sunspot Numbers
Student worksheet that demonstrates the 11-year cycle of sunspots. See Internet sites #7, 11, and 17.



Name _____

PRE/POST ASSESSMENT ACTIVITY

1. The Sun is so important to life on Earth. List 2 ways the Sun's light can be helpful and 2 ways it can be harmful.

Helpful:

a. _____

b. _____

Harmful:

c. _____

d. _____

2. Draw how the Earth revolves around the Sun.



TRUE OR FALSE

3. The Sun gives off radio waves, ultraviolet waves, and x rays.
4. Galileo observed the Sun and sunspots through a telescope in the 1600's.
5. Sunspots do not affect life on Earth or in space.
6. Sunspots are really magnetic storms on the surface of the Sun.
7. The Sun has 3 layers—the core, the chromosphere, and the convection layer. ..
8. The Sun is made up mainly of oxygen.
9. Sunspots appear on the surface of the Sun in a regular pattern—an 11-year cycle.
10. The Sun rotates, or spins on its axis, about every 27 days.
11. The Sun is a solid.

• • • **SUNSPOTS**

Name _____



GALILEO SEES THE LIGHT

Adapted from Thursday's Classroom

<http://www.thursdayclassroom.com/03feb00/article1a.html>

If you go outside at night and watch the stars for a long time, you will see that they move across the sky. They move because the Earth is turning. Long ago, many people thought that the Earth did not move. They thought that the stars, the Moon, and the Sun moved around the Earth! If you think that sounds silly, remember, these early scientists did not have any telescopes. All they had were two eyes, curiosity, and a star-filled sky.

Four hundred years ago, a scientist named Galileo loved to study the stars. At first he looked at the stars and planets with his eyes, but he wanted to see more. He decided to build a telescope. It wasn't the first telescope, but it was the best telescope in the world.

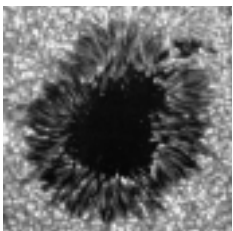
Can you imagine his excitement as he pointed his new telescope towards the stars? He could see that our Moon had mountains and valleys! He saw moons around Jupiter. His telescope amazed people all over Europe. Galileo showed his telescope to many famous people and let them look through it.

Galileo also used his telescope to study the Sun. During the summer of 1611, instead of going to the beach, he studied spots on the Sun. At first Galileo looked at the Sun through the telescope. What a mistake! It hurt his eyes.

Then, one of his students had a great idea. He pointed the telescope at the Sun and made an image of the Sun on a piece of paper. Galileo had already hurt his eyes, but this made it possible to study the sunspots safely.

Every day, he carefully drew pictures of the sunspots on the Sun. By looking at his drawings, he could tell that the sunspots were moving. He studied the drawings. He added up his numbers. Wow! The Sun must be spinning! He figured that the Sun spins around once every 27 days.

Galileo spent a lot of time looking at the planets. When he pointed the telescope at Jupiter, he also saw four tiny points of light. Each day the lights moved, but they were always around Jupiter. Galileo had discovered Jupiter's four biggest moons! This discovery made him famous.



Doing experiments made Galileo even more famous. Before Galileo, scientists did not do experiments. They thought and reasoned. Galileo made up experiments to prove his ideas.

Galileo also looked at the planet Venus. He was surprised by what he saw. Sometimes Venus looked like a crescent; sometimes it was full (like phases of the Moon). The only way that could happen would be if Venus moved around the Sun! In those days many people thought that the Earth was the center of everything. The Earth stood still and everything moved around our planet. The phases of Venus and the moons of Jupiter proved that the planets move around the Sun.

In Galileo's time, most people believed that the Earth stood still. Galileo's ideas were strange and exciting. There was a group of people that had the job of guarding people against bad ideas. This religious group was called the Inquisition. The Inquisition did not want Galileo to teach that the Earth moved around the Sun. They told Galileo that he could no longer teach those ideas. They thought that Galileo was wrong!

Now, we know that the Earth is not at the center of our solar system. Like all the other planets, the Earth moves around the Sun.

Thanks to Galileo and other brave scientists, we know the truth. The Earth is not at the center of everything. The most important thing Galileo taught us was a new way of doing science. By watching and experimenting you can learn a lot about nature. Galileo was a great scientist.

Fill in the blanks with these vocabulary words.

experiments 27 Sun sunspots Galileo telescope

Many years ago people thought that the Earth did not move. They thought that the stars, Moon, and the Sun moved around the Earth. Galileo used his _____ to study the Sun. By making an image of the Sun on a piece of paper, Galileo could study _____ safely. By looking at his drawings, _____ could tell that the sunspots were moving. He discovered that the _____ must be spinning. He figured out that the Sun spins on its axis once every _____ days. Galileo taught us a new way of doing science—by doing _____.

• • • **SUNSPOTS**

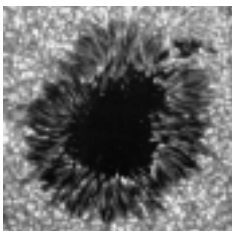
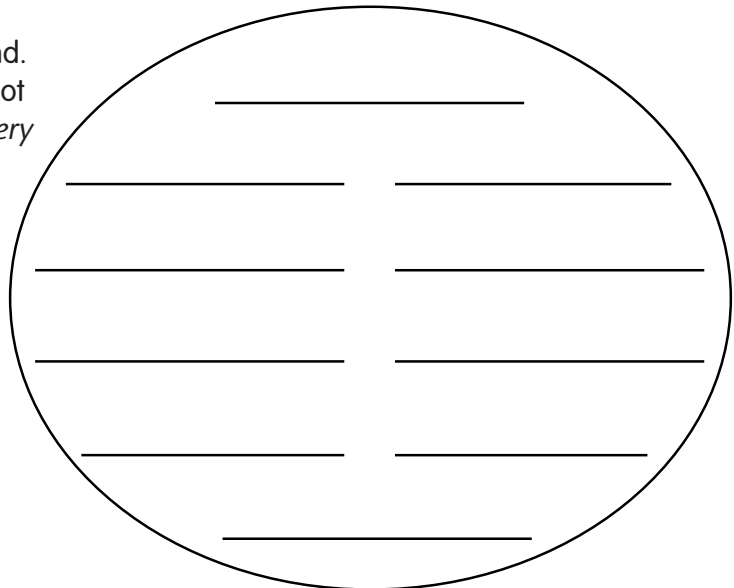
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SUNSPOT POEMS**SOME LIKE IT HOT!**

Did you ever learn in school
 That sunspots are really cool?
 They are!
 The Sun is hot
 But not that spot
 Or at least not as hot as the burning Sun.
 Everyday, scientists are having fun
 Counting those sunspots,
 Watching solar flares run,
 Waiting for the time when the spots are none.
 Studying the star.
 Studying the spots.
 Seeing how hot each spot has got.
 They have really learned a lot!

From Thursday's Classroom <http://www.thursdaysclassroom.com/14oct99/activity4.html>

Poems are fun to read, write and find.
 Have you ever found a poem? It does not
 have to rhyme. Look in the book, *Our Very
 Own Star: the Sun*, for ten words that
 seem interesting, fun, or crazy. Put
 them in the blanks in the Sun. Read it
 to a friend.

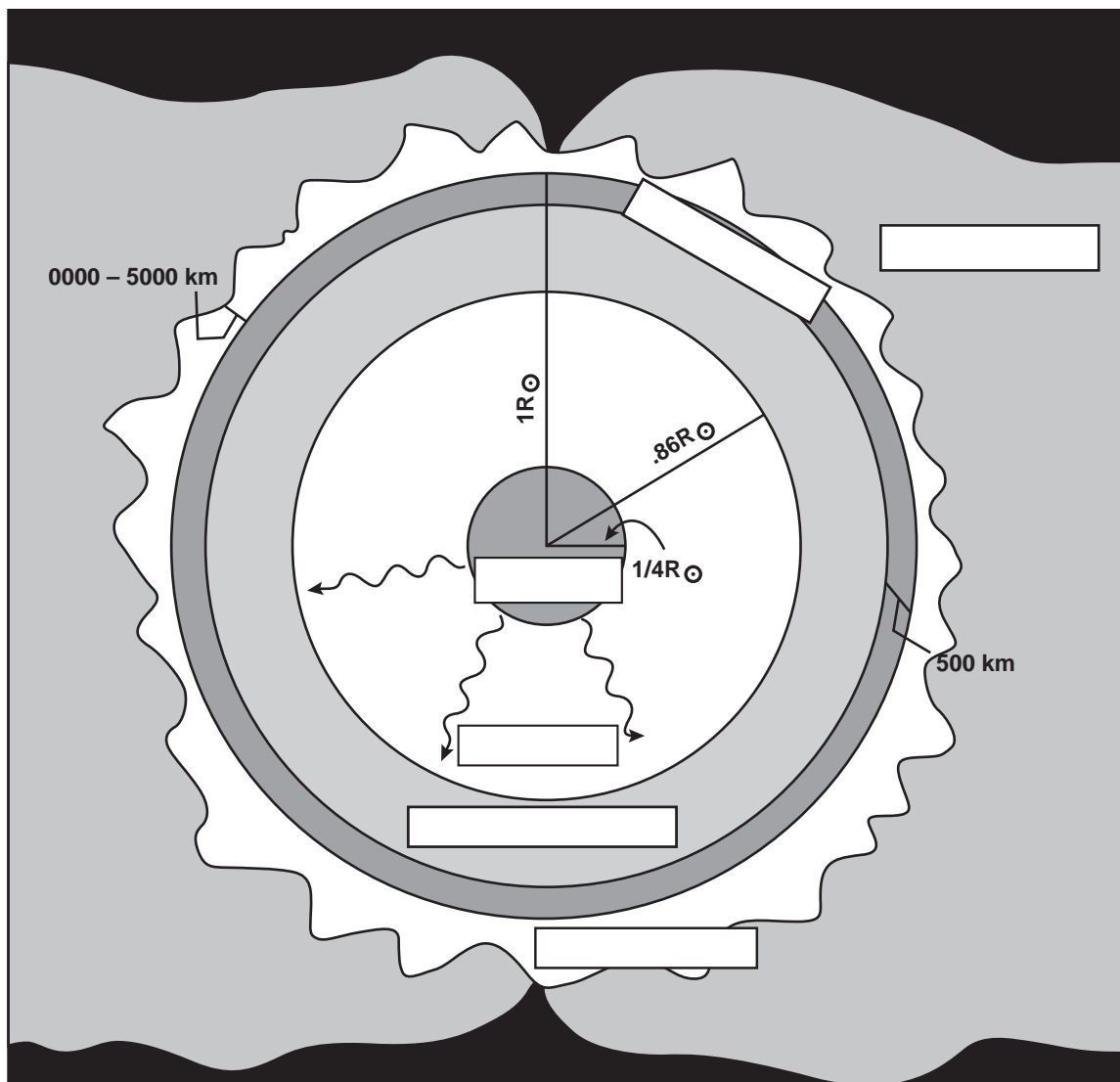


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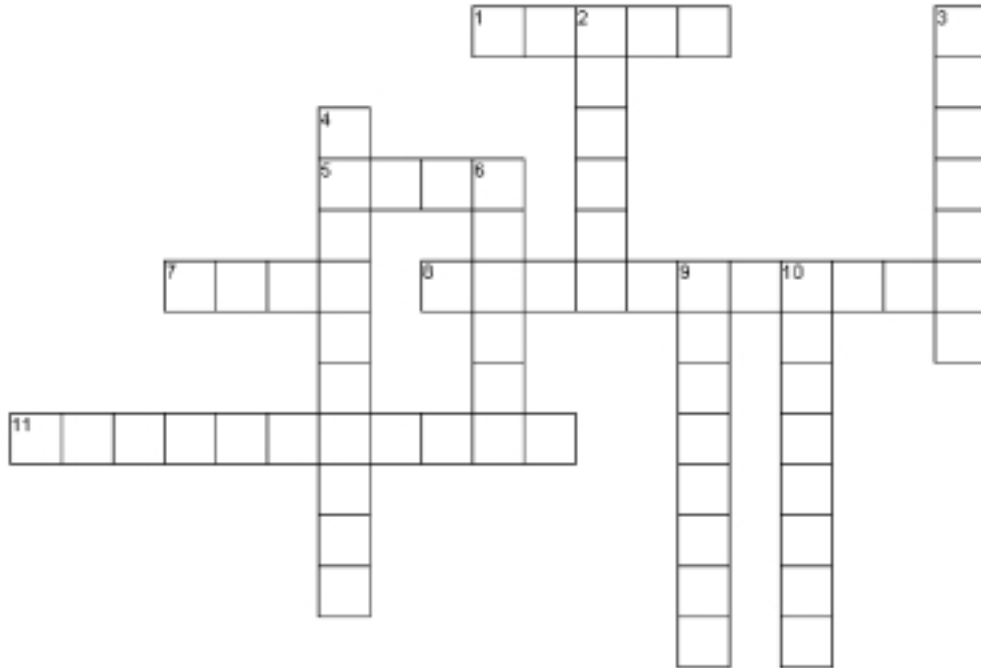
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LAYERS OF THE SUN

Label the 4 inner layers and 2 outer layers of the Sun in the box for the layer you are labeling.
Use these vocabulary words:

Core**Radiation layer****Convection layer****Photosphere****Corona****Chromosphere**• • • **SUNSPOTS**

Name _____

OUR VERY OWN STAR: THE SUN**ACROSS**

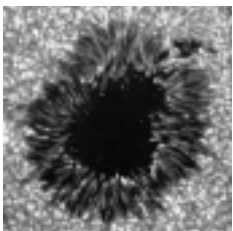
1. Our Sun is a medium yellow _____ star.
5. The Sun spins on its _____.
7. The center of the Sun is the _____.
8. The _____ is the surface of the Sun.
11. The Sun gives off _____ rays.

DOWN

2. Sunspots can _____ the Earth's weather.
3. _____ was the first scientist to observe and record sunspots.
4. We get valuable data about the Sun from _____.
6. The Sun is in the shape of a _____.
9. _____ are irregularly shaped dark areas on the Sun.
10. The Sun is made up mainly of _____.

VOCABULARY

Ultraviolet
 Photosphere
 Core
 Axis
 Dwarf
 Affect
 Hydrogen
 Sphere
 Satellites
 Gallileo
 Sunspots



• • • • •

Name _____

SUNSPOT NUMBERS

Astronomers have been observing and recording the number of sunspots for hundreds of years. After analyzing the data, astronomers have determined that sunspots increase and decrease over an 11-year cycle. Listed below are the amount of sunspots seen in December of each year over an 11-year period. Make a line graph of the number of sunspots seen for each of the years listed below. Be sure to add the years and the scale for counting the number of sunspots.

1991-144 sunspots

1992-82 sunspots

1993-48 sunspots

1994-26 sunspots

1995-10 sunspots

1996-13 sunspots

1997-41 sunspots

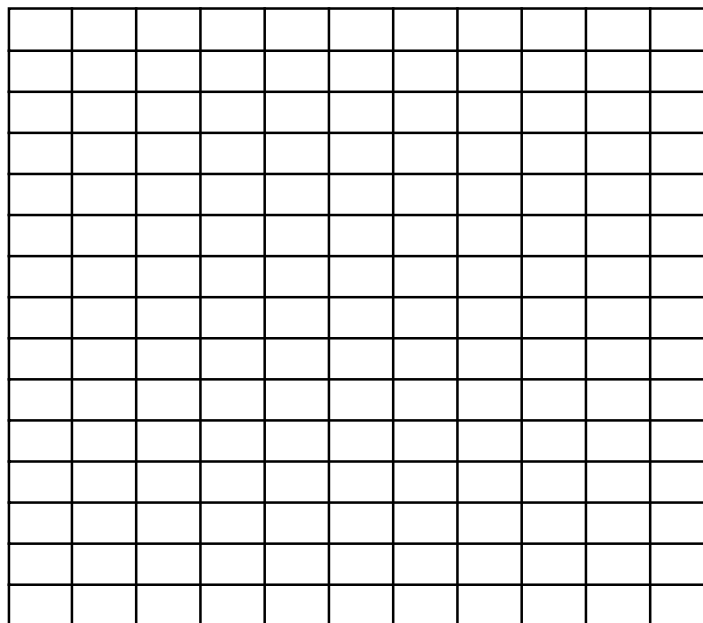
1998-81 sunspots

1999-84 sunspots

2000-104 sunspots

2001-132 sunspots

NUMBER OF SUNSPOTS

**YEARS**

Answer the following questions about your data and the graph.

1. According to this data, in what year did astronomers see the most amount of sunspots? The least? _____
2. If the amount of sunspots seen follows the same pattern, what do you predict will be the number of sunspots seen in 2006? 2012? _____
3. As the number of sunspots increases, what do you think will happen on Earth? _____

• • • SUNSPOTS

INTERNET CONNECTIONS

1. Information on Galileo and sunspots <http://es.rice.edu/ES/humsoc/Galileo/Things/sunspots.html>
2. Information on the Homemade Sunspot Viewers
http://stp.gsfc.nasa.gov/educ_out/summer01_pr/activities/Sunspot_Viewer.pdf
3. Information on SOHO (Solar and Heliospheric Observatory) and daily images of the Sun
<http://sohowww.nascom.nasa.gov>
4. Information on the size of the Sun compared to the size of the Earth <http://inspire.ospi.wednet.edu:8001/curric/space/sun/sunearth.html>
5. Information on sunspot numbers http://science.nasa.gov/ssl/pad/solar/greewch/spot_num.txt
6. Information on the layers of the Sun
http://www.genesismission.org/product/genesis_kids/aboutgenesis/solar_model.html
7. Information on the rotation of the Sun including SOHO images
<http://solar-center.stanford.edu/spin-sun/spin-sun.html>
8. Lessons on sunspots and ancient and modern solar science
<http://cse.ssl.berkeley.edu/segwayed/abtsunspots.html>
9. Stories of NASA science and research that are easily understood by the nonscientist <http://science.nasa.gov>
10. Copies of the booklet *Our Very Own Star: The Sun*
http://stp.gsfc.nasa.gov/educ_out/kids_booklet/EP-2002-1-014_GSFC_Eng.pdf
11. Lesson plans and educational activities from NASA <http://www.thursdaysclassroom.com> and
<http://www.thursdaysclassroom.com/14oct99/activity4.html>
12. Overview of sunspots including their history and tips on how to safely view sunspots <http://www.exploratorium.edu/sunspots/>
13. Resource of space educational services, instructional materials, NASA projects and news
<http://spacelink.nasa.gov>
14. Basic information on the Sun and layers of the Sun. Includes video clips of the Sun.
http://starchild.gsfc.nasa.gov/docs/StarChild/shadow/solar_system_level2/sun.html
15. More factual information about the Sun. Also includes a timeline of Sun observations.
<http://spacekids.hq.nasa.gov/osskids/animate/sun.html>
16. Easy to read information on sunspots, sunspot cycles, and ultraviolet light <http://kids.msfc.nasa.gov>
17. Current information on the present solar cycle <http://sunspotcycle.com/>

